Value Maximization

Through Advanced Technologies

Comprehensive solutions for ethanol industry... globally.

New technologies for enhancing performance of existing facilities: Yield Maximization; Co-Product Generation; Product Flexibility; Water & Energy Reduction and Equipment Retrofit.

praj | Ethanol Plants

One-Stop-Shop For Beverage, Industrial, Pharmaceutical & Fuel Grade Ethanol Plants...

With over 700 references in more than 70 countries, PRAJ has extensive experience of designing and installing beverage, fuel, pharma and perfumery grade alcohol plants based on variety of starch and sugar based feedstocks. With focus on offering sustainable solutions, PRAJ is continually upgrading and innovating technologies for delivering enhanced plant performance including for existing facilities - be it product maximization or co-product generation; flexibility of producing multiple products; Capacity enhancement; water & energy reduction or retrofitting equipment.

enfinity

Biomass to Ethanol Technology

Continuing its efforts in bringing advanced technologies and innovations to the ethanol industry, PRAJ has started offering its 'enfinity' - Biomass to ethanol technology with integrated Smart Bio refinery™. PRAJ's Smart Bio refinery™ will process multiple agriculture residues (biomass) and shall produce multiple products like Bio ethanol, Bio CNG, Power, CO_2, Bio Fertilizer, Bio chemicals etc. The Smart Bio refinery™ will enhance the returns through the value added products.

PRAJ has developed innovative 'Bolt-ON' Option using the 'enfinity' technology which can be integrated with existing 1st Generation distillery plant / Sugar mill which will benefit with year round operations and lower CAPEX for better economic viability.

Advanced Bioprocess Technologies

Hiferm™ Fermentation Technology

- **CombiFerm™** Combines the best of Continuous & Batch Fermentation with robust yeast strain
- Efficiently processes multiple feedstock like Sugarcane/Sugar beet/Sweet Sorghum Syrup / Molasses – B/C and their combination
- High ethanol titre leading to lower water footprint and reduction in energy and effluent
- Low CIP effluent
- Delivers consistent plant performance with reduce, recycle and reuse of effluent streams
- Ease of operation
- Yeast strains suitable for production of various grades of alcohol

HBRTF (High Brix Ready to Ferment) Technology / HTM (High Test Molasses) for ethanol

- Use of clarified concentrated sugarcane juice with round-the-year operation for shorter sugarcane crop cycle
- Biochemical catalysis
- Lower footprint
- Hygienic design
- Shelf life of HTM more than 6 months.

Ecofine™ & EcoSmart™ Advanced Distillation & EcoMol™ Dehydration Technologies

Ecofine™ Distillation Technologies
for Fuel, Beverage and Industrial grade alcohol

- Scientifically designed distillation system delivering reliable performance
- Multiple design options like Atmospheric, Vacuum, Multipressure and Split Distillation
- Product flexibility : Rum Spirit, GNS, Extra Neutral Alcohol, Vodka grade spirit as well as Korean A, B or Japanese grade
- Technologies for Speciality Spirits like Scotch & Whisky, Brandy, Grape Spirit and Malt Spirit
- Technologies for solvent recovery to obtain furfural, acetone, methanol, isopropyl alcohol, butanol and ethanol

EcoSmart™ Distillation Technologies to produce multiple products (Industrial, Pharma & Perfumery grade alcohol)

- Energy reduction upto 30% by adopting advanced technologies like **EcoSmart™-ED Evaporative Distillation or upto 90% reduction by EcoSmart™ MVR** technology

EcoMol™ Molecular Sieve Dehydration (MSDH) Plants

- Energy efficient (low & high steam pressure) **EcoMol™** Molecular Sieve Dehydration system for production of ultra dry ethanol for fuel purpose

Advanced Wastewater Treatment Technologies

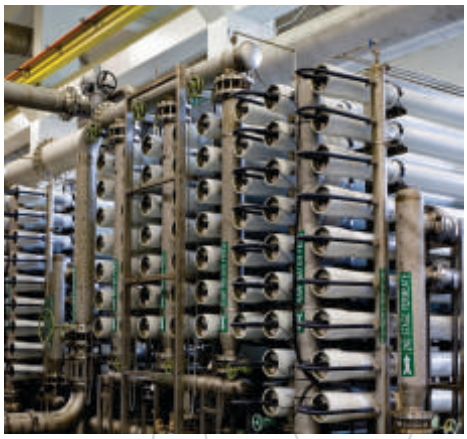
Technologies available to treat wastewater generated in ethanol plants using various sugar/starch based feedstocks and waste biomass.

EcoMet XT™ Biomethanation system
for maximization of biogas (methane) production; continuous operation for longer duration without fouling of bioreactor.

Reduce, Recycle & Reuse Technologies
for maximization of water recycle and reuse through thermal treatment **(Ecofine™ CST-BMSW Condensate Stripping) while Membrane based (UF/RO) and biological system (MBR, SBR/ASP, MBBR)** for **RSW Condensate treatment.**

Zero Spent Wash Discharge (ZSD) Technologies

- Energy integrated Raw Spent Wash (RSW) evaporation followed by either composting (**Biocomp™**) or incineration boiler.
- Energy integrated Biomethanated Spent Wash (BMSW) evaporation followed by either composting (**Biocomp™**) or drying (**EcoDry™** ATFD).



Advanced Co-Product Recovery Technologies

CO_2 Recovery Plant (EcoPure™)

- Production of Food Grade (ISBT compliant) and industrial grade CO_2
- Skid mounted units
- Low operating cost

EcoClean™

- Advanced Biogas Cleaning Technologies for removal of CO_2 & H_2S from Biogas

Biogas to Power

- Production of power using **EcoClean™** and power generation using gas engine

Biogas to bioCNG

- Production of methane rich CNG for industrial application and as automotive fuel using **EcoClean™**

EcoDry™ DDGS

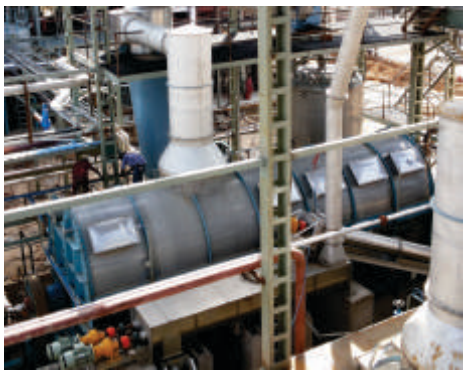
- Steam tube bundle dryer
- Energy integrated evaporation and drying technologies for producing DWG/DDGS in grain distilleries

EcoDry™ Yeast

- Double drum dryer
- Good quality protein rich dry yeast for animal feed, aqua culture or poultry purpose

Dryer-Vapour Integration

- Suitable for energy recovery from DDGS dryer and integration in ethanol facility for energy reduction
- 40 to 50% energy reduction depending on type of dryers



Resources

The key to successfully delivering over 700 projects across different geographies is our vast, multi-disciplinary, multi-locational and dedicated resources.

Design & Engineering

In-house core team of professional engineers from different disciplines (Chemical, Piping, Mechanical, Electrical, Instrumentation, Civil, etc.) together with other technical staff ensure that your projects are engineered in the most optimum way.

Project Management, Construction & Commissioning

With strong focus on project planning and scheduling and innovative execution strategies, this group works with customer from day one to ensure that the project is completed within the agreed time frame.

Procurement & Quality Assurance

Quality Assurance teams at Praj pursue stringent testing at various stages of procurement and production; not only in our own manufacturing plants but also at vendors' facilities and project sites.

Praj Matrix - R&D Center

Backed up by Centers of Excellence and Pilot Plant facilities, Matrix - R&D Center leads Praj's research and development efforts in fermentation, wastewater treatment and reuse, study of feedstock, process development and validation with specific focus on yields, energy consumption, water recycle, etc. Matrix is also engaged in the development of Second Generation Bio-fuels.

Manufacturing Facilities

Equipment manufacturing is carried out at our well-equipped manufacturing units spread over an area of 71,000 m^2 (covered space : 34,750 m^2).

Manufacturing Highlights

- 16500 T/Year (Expandable)
- Maximum Dimensions : 8.5 m dia x 50 m length x 300 T weight
- Maximum thickness : 150 mm

Global Standards & Codes

ASME Sec VIII Div. I & II, IS 2825, Ad Merkblatter, PD 5500, TEMA, Pressure Equipment Directive, SMPV Rules, DIN, API 650 and AS 1210.

Health, Safety 8. Environment

The Company has a stated HSE policy and follows it rigorously at every step, from design to commissioning.

Value Added Services

For Value Maximization

Technical Audit for Value Maximization

- Study of unit operations
- Opportunities for reduction of energy, water and effluent
- Utilization of existing assets for increasing plant capacity
- Possibility of retrofitting beverage alcohol plant to existing ethanol facility

Plant Operation & Maintenance Training

- Optimization of unit operations, enzymes, yeast and utility consumption
- Operator training for scientific operation of plant, CIP and logistics

After-Sales Service for retrofitting and equipment replacement

- Supply of equipment like degassifying column, fusel oil recovery and concentration system, methanol recovery system, dehydration plant, molsieves, heat exchangers, vapor bottles, etc.

Process Performance Enhancement & Trouble Shooting Services

- Demonstration and supply of Effytone™ range of fermentation process enhancers
- De-bottlenecking of unit operations

Analytical Services for feedstocks and products

- Analysis of feedstock, product industrial/beverage/fuel and pharma grade ethanol as per international standards like AOAC, EBC and ASTM
- Best-in-class analytical facility for feedstock and product analysis and pilot facility for 1G and 2G fermentation study.

HiFERM® Fermentation Plants | ECOFINE® Distillation Plants | ECOMOL™ Molecular Sieve Plants | ECOMET-XT™ Biomethanation | CombiFerm™ Advanced Fermentation | effytone™ Performance Enhancers

Ecodry™ Drying Plants | Ecovap™ Evaporation plants | EcoPure™ CO_2 Recovery | EcoSmart™ Smart Distillation | EcoClean™ Biogas Cleaning | enfinity Biomass to Ethanol Technology

Praj Worldwide

India I South Africa
Thailand I UAE I USA

praj
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